Salton Sea Ecosystem Restoration
Air Quality Working Group Meeting

Alternatives Update

January 11, 2005
Ontario, CA

Topics

- **Update on Alternatives**
  - **No Action & Variability Baseline**
  - **Partial Sea Configurations**
  - **Minimal Barrier Configurations**
- **Project Phasing**

Alternatives

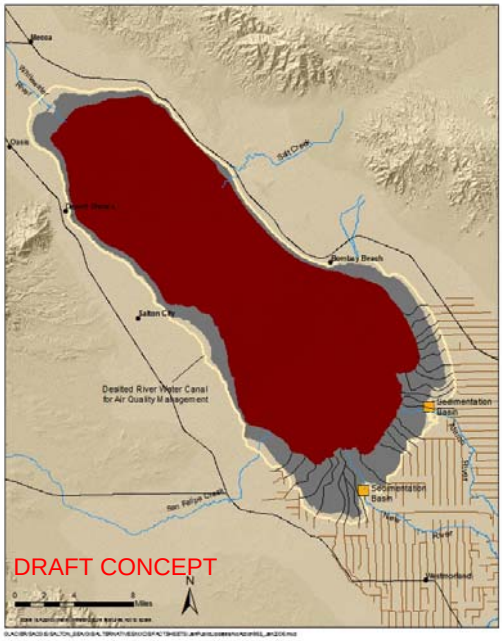
- **Process**
  - **Presented "proposed final range of alternatives" to the Advisory Committee on December 8th**
    - Described the range of configuration and the broad screening criteria
      - Legislative and regulatory requirements
      - CEQA Guidelines

CEQA Guidelines for Range of Alternatives

- **Must permit a reasoned choice**
- **Includes alternatives that would lessen or avoid significant effects**
- **Must <u>feasibility</u> attain <u>most</u> of the basic objectives**
  - **Site suitability**
  - **Economic viability**
  - **General Plan consistency**
  - **Regulatory limitations**
  - **Jurisdictional boundaries**
  - **Ability to legally acquire, control, or have access to**

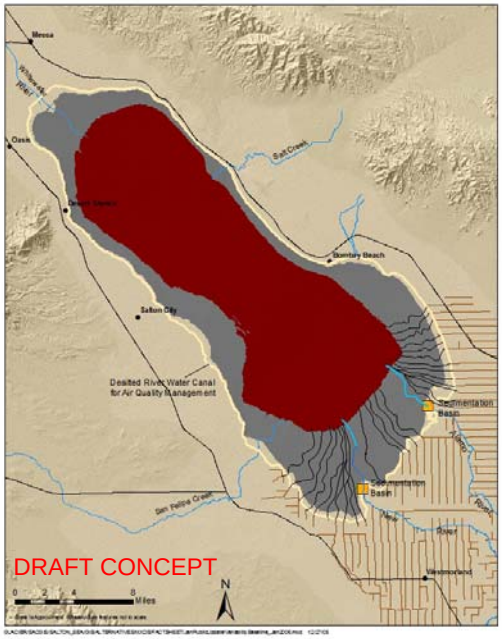
No Action and Variability Baseline

- **No Action Alternative**
- **Variability Baseline Alternative**



No Action Alternative

- **Average annual inflow of 958,000 acre-feet/year**
- **Elevation at end of 75 years estimated as -249 feet msl**
- **Air Quality Management at elevations below -235 feet msl**
- **Pupfish Connectivity when Sea Salinity is >90 ppt (per HCP)**



Variability Baseline

- **Average annual inflow of 650,000 acre-feet/year (current estimate)**
- **Elevation at end of 75 years estimated as -263 feet msl**
- **Air Quality Management at elevations below -235 feet msl**
- **Pupfish Connectivity when Sea Salinity is >90 ppt (per HCP)**

Project Objectives per Legislation and Statutory Mandates

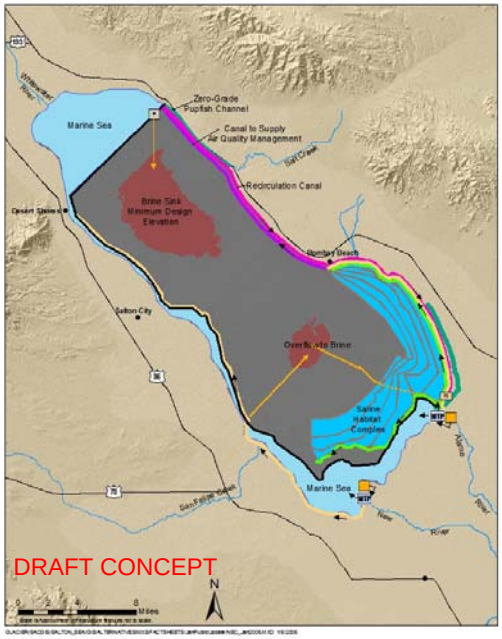
- **Restore long-term stable aquatic and shoreline habitat for historic levels and diversity of fish and wildlife that depend upon the Salton Sea**
- **Restoration of the Salton Sea ecosystem and permanent protection of wildlife dependant on that ecosystem**
- **Protect federal and state listed species**
- **Protect water quality to support beneficial uses**
- **Eliminate air quality impacts due to restoration**
- **Continued use of Salton Sea as a permanent drainage reservoir**
- **Assess protection of recreational opportunities and creation of opportunities for improved local economic conditions**

Air Quality Management Assumptions for Development of Water Balance

- **100% of exposed playa would be subject to Air Quality Management**
- **50% of the exposed playa would be managed with water efficient vegetation**
  - **1 acre-foot/acre/year desilted river water**
  - **Blend saltwater into air quality management supply, ~9 ppt**
  - **Supplied around the exposed supply via constructed canals with turnouts to individual air quality management areas**

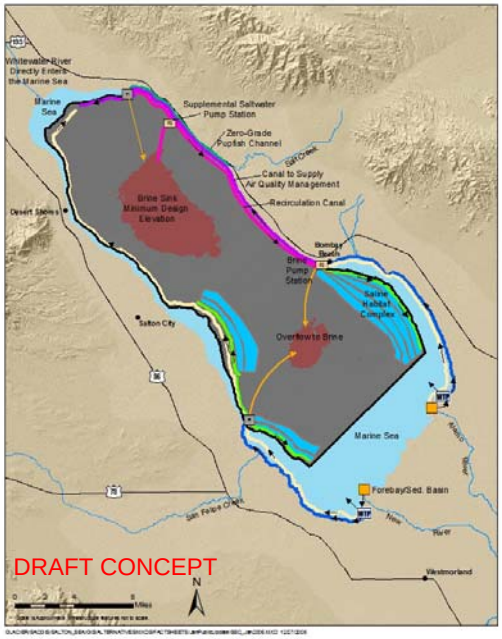
Partial Sea Configurations

- **North Sea Combined with Saline Habitat Complex**
- **South Sea Combined with Saline Habitat Complex**
- **North Sea and Minimal Barrier**
- **Concentric Rings**



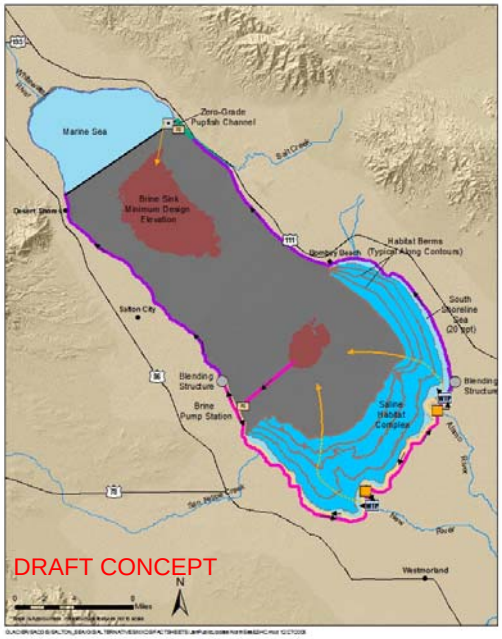
North Sea Combined with SHC

- **Barrier at 14 miles north of mid-sea**
- **25,000 acres SHC (18,000 acres water)**
- **Recirculation**
- **Water Treatment for Sea and SHC**
- **Pupfish Connectivity**
- **Total area of exposed playa 152,000 acres**



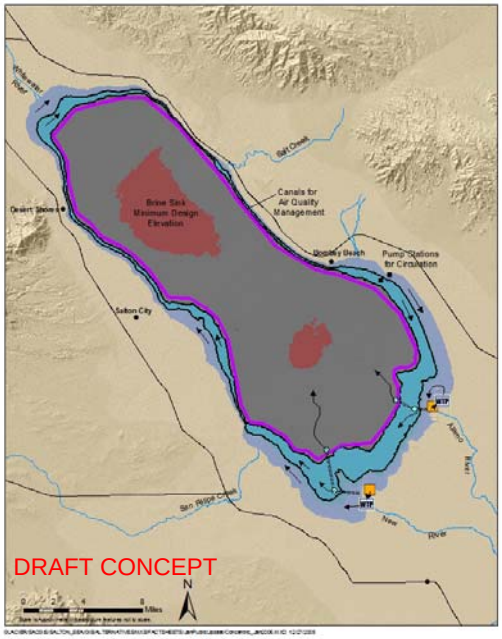
South Sea Combined with SHC

- **Barrier at 10 miles south of mid-sea**
- **25,000 acres SHC (18,000 acres water)**
- **Recirculation**
- **Water treatment for Sea and SHC**
- **Pupfish connectivity**
- **Total area of exposed playa 152,000 acres**



North Sea and Minimal Barrier

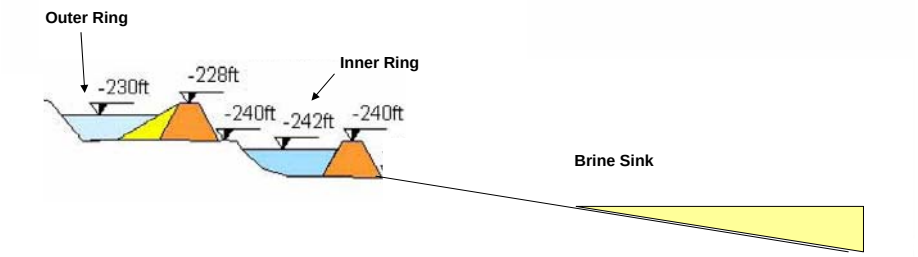
- **Barrier at 13 miles north of mid-sea**
- **~6,000 acres of marine lake in south**
- **50,000 acres SHC (38,000 acres water)**
- **Recirculation to maintain water quality**
- **Water treatment for flows to habitat**
- **Pupfish connectivity**
- **Total area of exposed playa 138,000 acres**



Concentric Rings

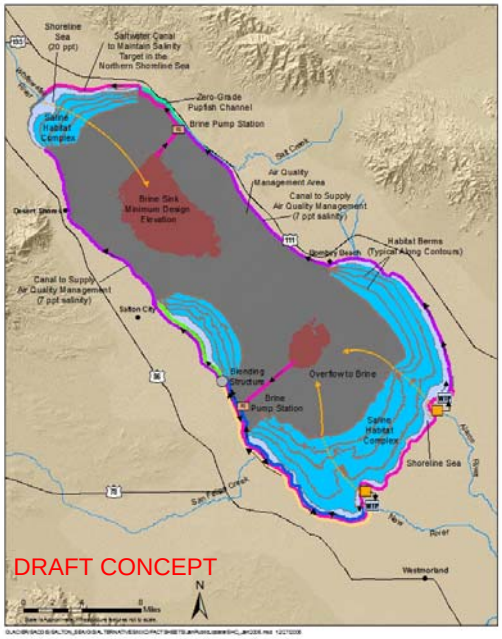
- **Two Sea rings**
  - **20 ppt outer**
  - **35 ppt inner**
- **60,000 Acre Seas**
- **Habitat within Sea rings**
- **Water treatment for Sea**
- **Recirculation**
- **Pupfish Connectivity**
- **Total area of exposed playa 144,000 acres**

Concentric Rings Section



Concentric Rings – Key Points

- **Construct outer barrier first**
  - **Initial construction in wet**
- **Limit inflow to each ring for salinity control**
  - **Requires forebay basin and flow control at river confluences**
  - **Bypass excess inflows to Brine Sink**
- **Provide circulation to achieve minimum 20 ppt salinity in entire ring**
  - **300 cfs pump station in ring to increase Alamo and New River salinity**
- **Create habitat within Sea rings**
- **Construct downstream perimeter dikes as Sea recedes**
- **Geotubes not being considered at this time**



Minimum Barrier Alternative

- **Maximum created Saline Habitat Complex (SHC)**
  - **Up to 75,000 Acres (65,000 acres wet)**
- **Shoreline Seas for water distribution and pupfish**
- **Water treatment for flows to habitat**
- **No deep marine sea**
- **Total area of exposed playa 135,000 acres**

Minimal Barrier Alternative

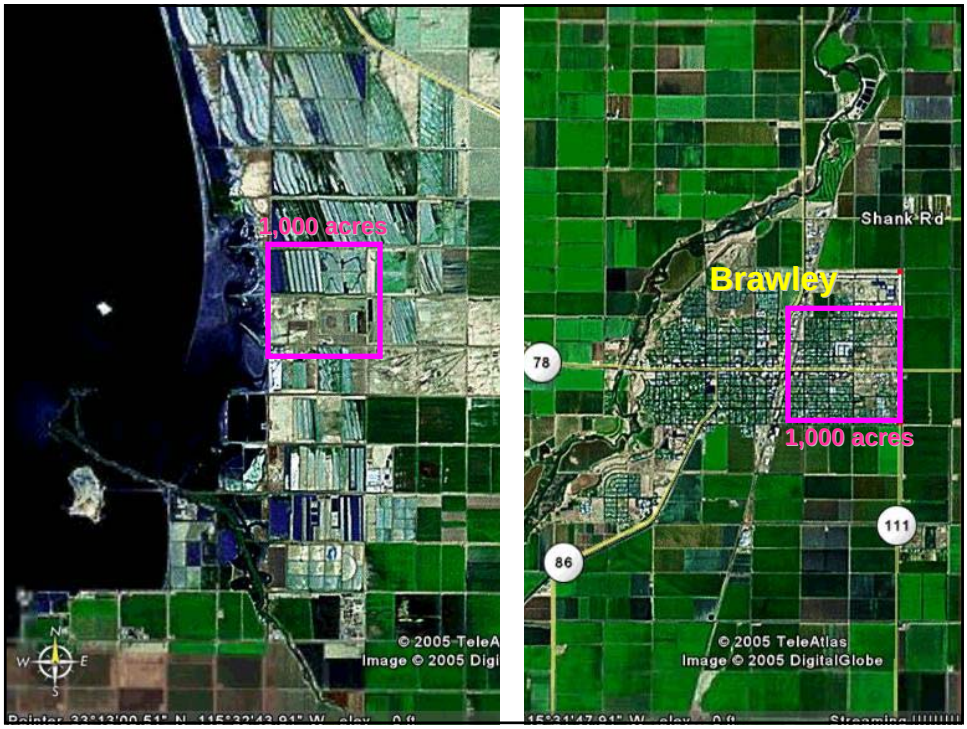
- **Objectives**
  - **Create maximum managed habitat with available water supply**
  - **Create habitats in places of maximum habitat value**
  - **Create and arrange saline habitats that can replace estuary functions**
  - **Provide pupfish connectivity to sea habitat as possible**
  - **Provide improved water quality to habitat**

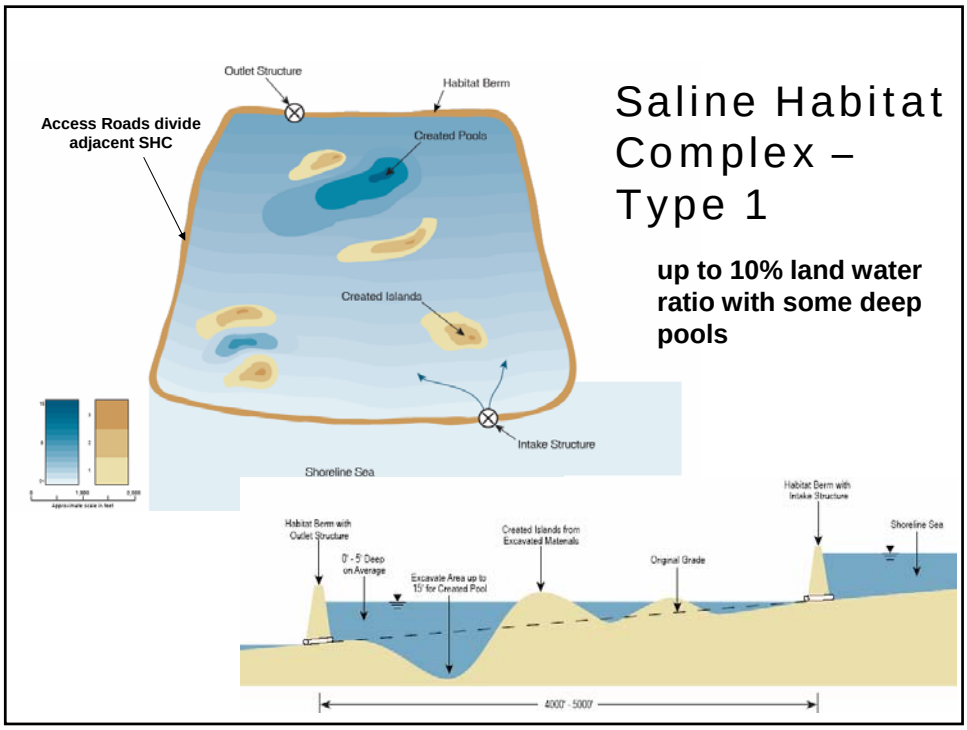
Minimal Barrier – Key Points

- **Construct perimeter dike for north and south shoreline sea first (extend dike as far as possible)**
- **Limit inflow to shoreline sea using inflow regulating structures**
- **Blend brine sink water with (treated) inflows to maintain 20 ppt salinity**
- **Construct habitat berms for Saline Habitat Complex (SHC) in dry as Sea recedes**
- **Distribute water to saline habitat complex**
- **Control SHC inflows so at least 75% area is between 20-60 ppt**
- **Maintain pupfish connectivity**
- **Treat drainage water to reduce ecorisk in shoreline sea**

Saline Habitat Complex

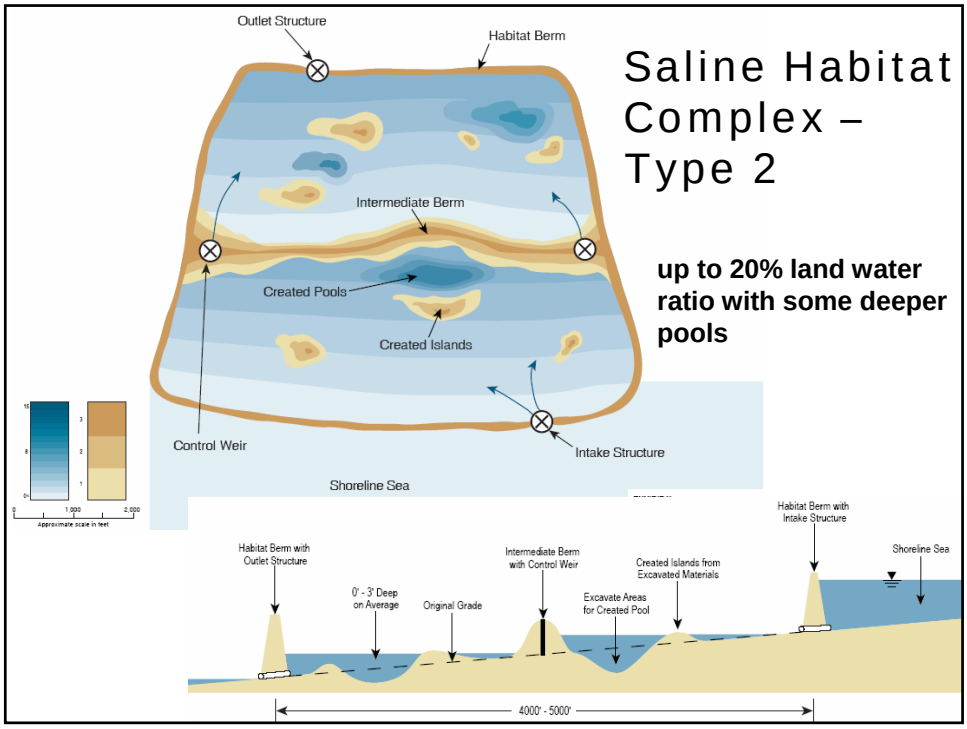
- **Supply is distributed through managed "Shoreline Sea"**
  - **Sea serves as pupfish connectivity area**
  - **Extend dike to capture drainages and pupfish areas**
- **Habitat Complex is modular and would be created as Sea recedes**
- **Habitat berms created along Sea contours**
  - **about every 6 feet drop**
  - **limited height allows simple construction**
- **Various types of habitat can be created**
  - **salinity, depth, flow**
- **Excavated areas within each SHC can create more habitat features and complexity**
- **Flows must be managed in each SHC**
  - **Provide access to flow control structures**





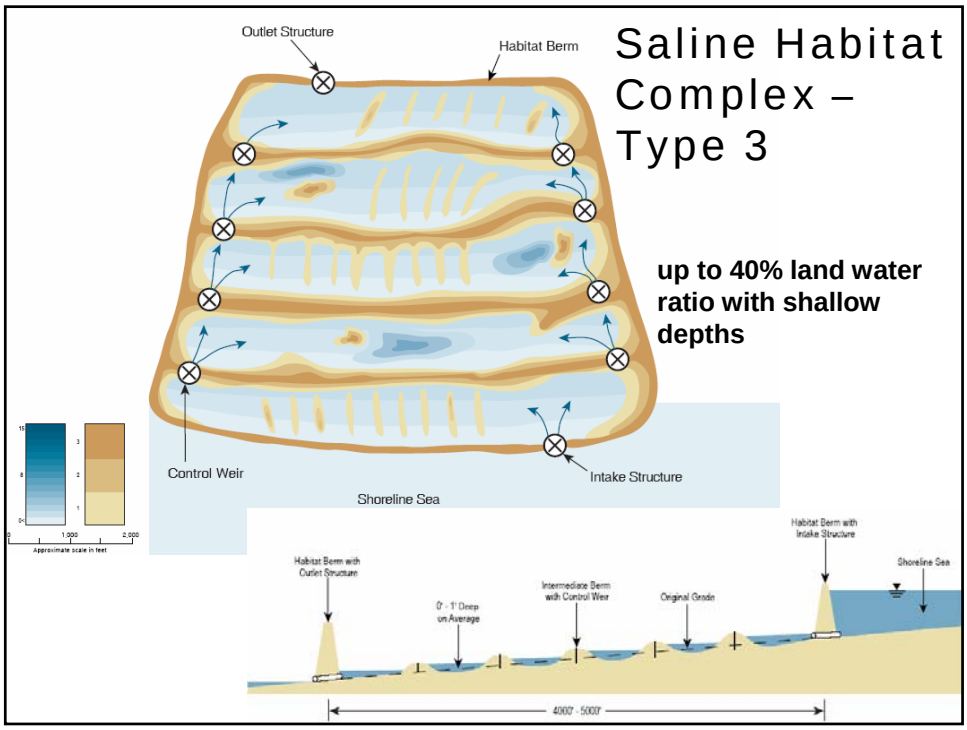
Saline Habitat Complex – Type 1

up to 10% land water ratio with some deep pools



Saline Habitat Complex – Type 2

up to 20% land water ratio with some deeper pools



Saline Habitat Complex – Type 3

up to 40% land water ratio with shallow depths

Barriers

- **Major structure across Sea**
  - **Between 20 and 55 feet tall (plus over-excavation)**
  - **Division of Safety of Dams jurisdiction**
  - **USBR Public Protection Guidelines**
- **Design Criteria**
  - **Seismic**
  - **Settlement**
  - **Seepage**
  - **Offsets**
  - **Flooding/overtopping**
  - **Constructability**

Perimeter Dikes

- **Impounds significant water volume but height is 15 - 20 feet max. (water less than 15 feet high)**
- **Must satisfy DSOD and USBR Public Protection Guidelines Standards**
- **Used in Concentric Rings, Combined configurations, and in Min. Barrier (Shoreline Sea only)**

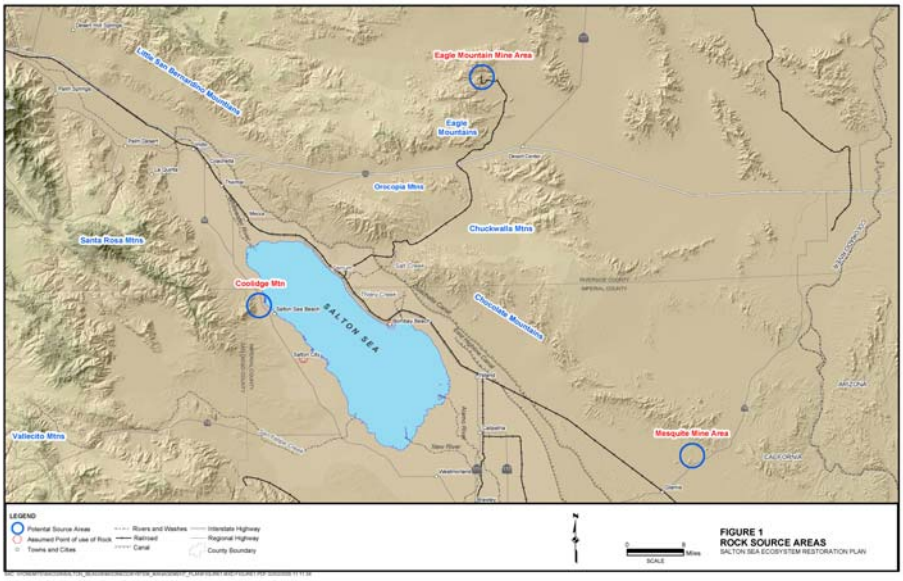
Habitat Berms

- **Constructed in the dry**
- **Not DSOD jurisdictional**
- **Minimal loss of facility or habitat if failure**
- **Local compacted embankment**
- **Rip-rapped**
- **Used in Saline Habitat Complex (Main Berms)**

Construction Considerations

- **Barrier and Perimeter Dike quantities may range from 60 to 130 Million Cubic Yards (DWR Design)**
  - **Majority assumed "well graded" rock from 1 to 4 foot in diameter**
  - **Equipment limitations**
- **Quarry**
  - **Each Side?**
  - **Distance**
  - **Methods/Handling**
- **Rock placement**
  - **Water**
  - **Land**
- **Production rates on rockfill**
  - **5 MCY per year may be possible**

Rock sources under investigation



Construction Considerations

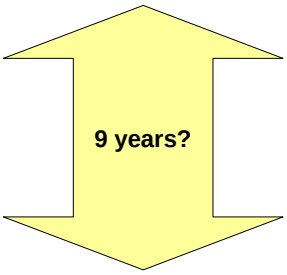
- **Foundation**
  - **Lack of Data / Data extrapolation**
  - **Sea floor deposits (organics)**
  - **Overexcavation**
  - **Treatment**
  - **Settlement**
  - **Liquefaction Potential**
- **Dredging Disposal**
  - **In-Sea Disposal**
  - **Use as Habitat**

Construction Considerations

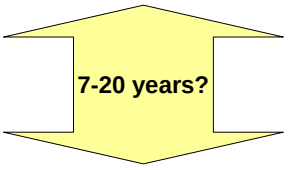
- **Air Quality**
  - **Construction Emissions on Rock Transport ONLY**
    - May take 20+ years to transport 100 MCY rock to site by truck (20 miles RT)
  - **Use of electric conveyors less emissive, but Rock may be too large**
- **Schedule**
  - **Timing of habitat benefits**
  - **Degraded water quality**
  - **Construction methods**

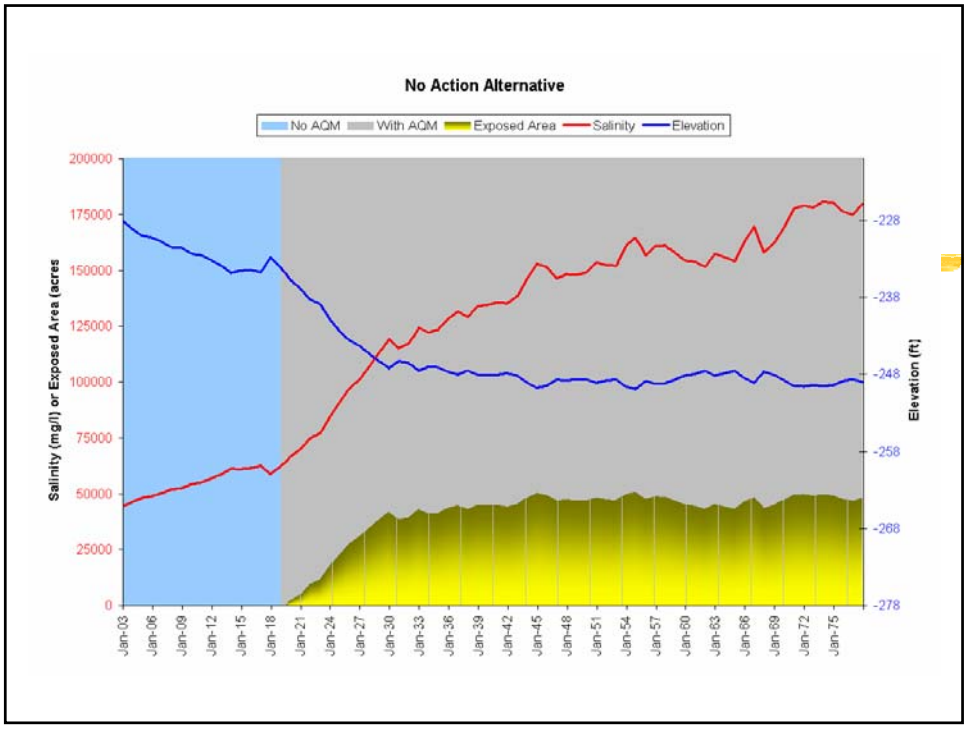
Project Phasing

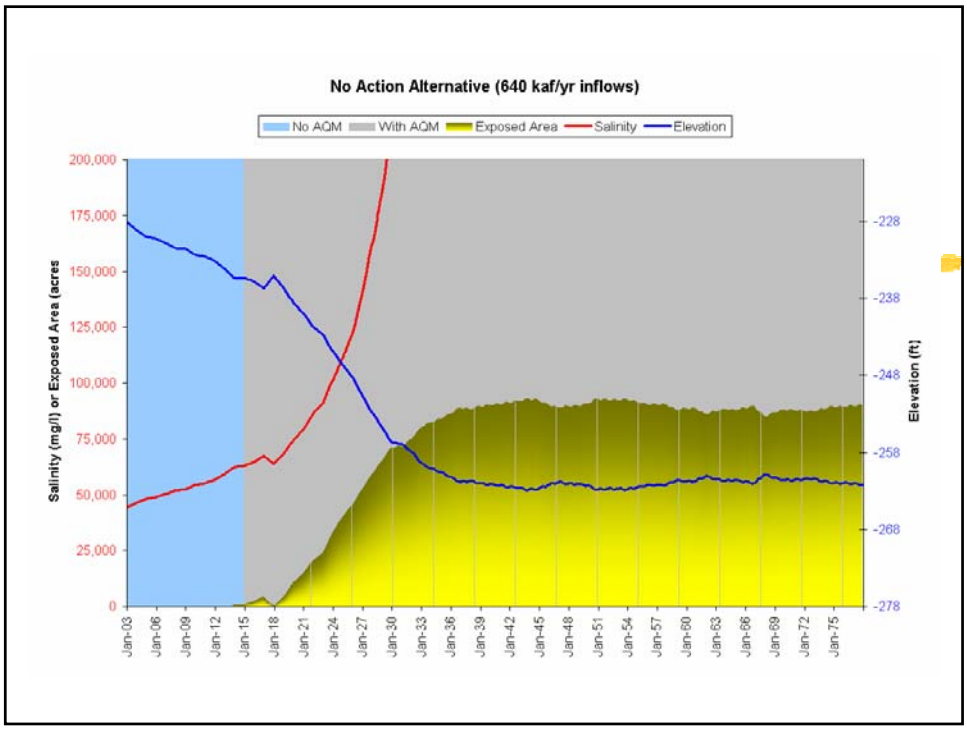
- **Schedule**
  - **PEIR with Preferred Alternative**
  - **Project Specific EIR**
  - **Preliminary and Final Design**
  - **Financing**
  - **Construction Bids/Award**
  - **Permits**

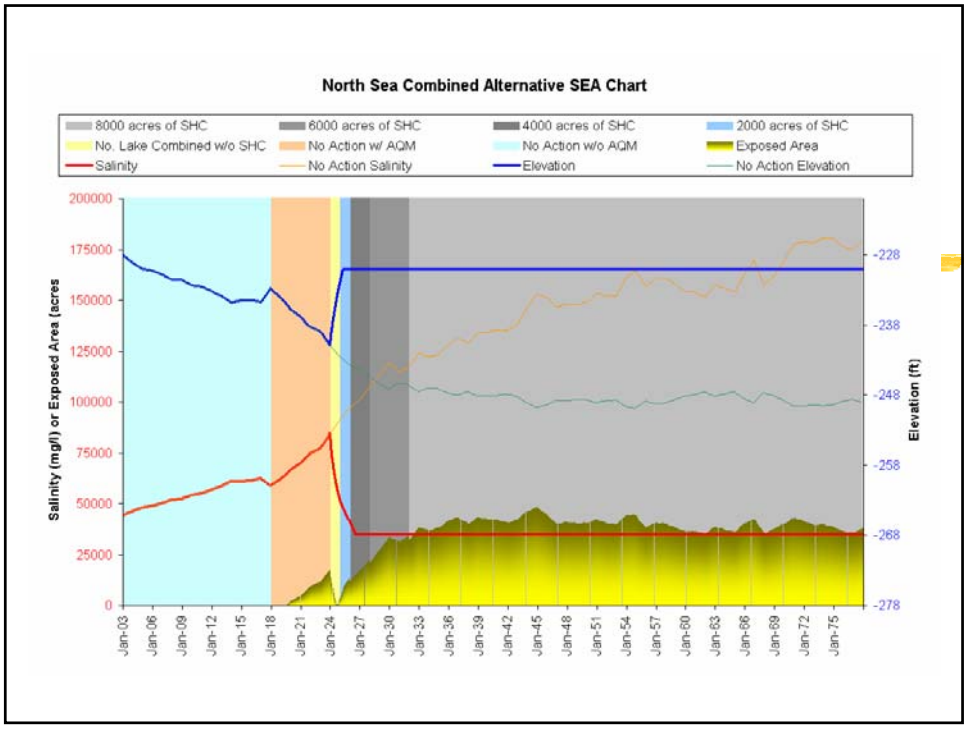


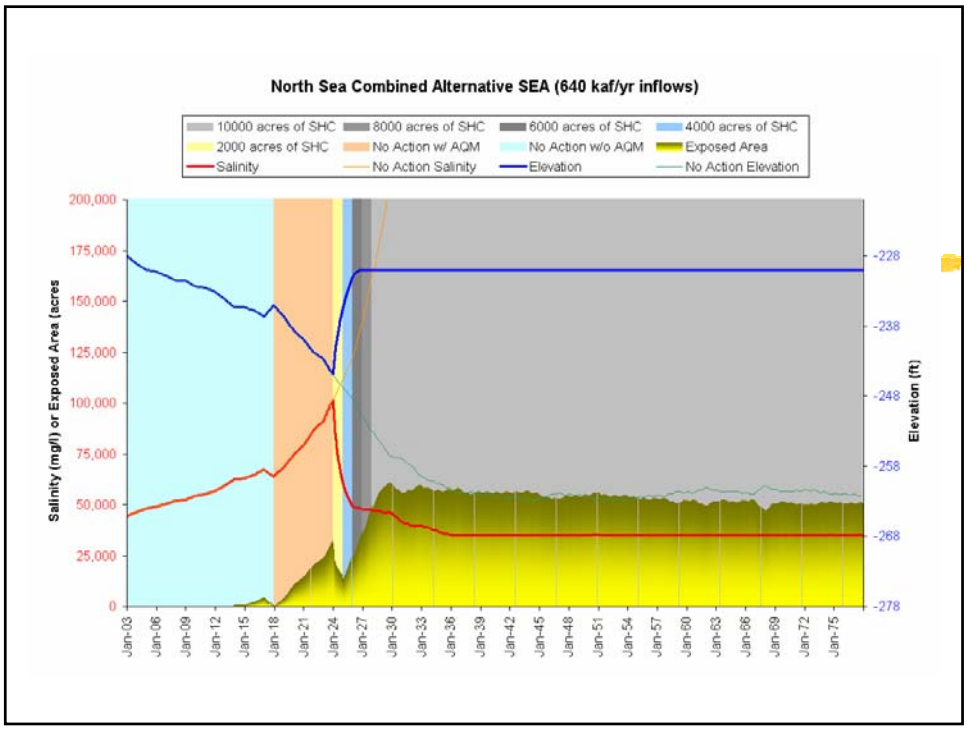
  - **Mobilization**
  - **Begin Construction**
  - **End Initial Construction**




No Action Alternative
No AQM
With AQM
Exposed Area
Salinity
Elevation
Salinity (mg/l) or Exposed Area (acres
Elevation (ft)
200000
175000
150000
125000
100000
75000
50000
25000
0
-228
-238
-248
-258
-268
-278
Jan-03
Jan-06
Jan-09
Jan-12
Jan-15
Jan-18
Jan-21
Jan-24
Jan-27
Jan-30
Jan-33
Jan-36
Jan-39
Jan-42
Jan-45
Jan-48
Jan-51
Jan-54
Jan-57
Jan-60
Jan-63
Jan-66
Jan-69
Jan-72
Jan-75


No Action Alternative (640 kaf/yr inflows)
No AQM
With AQM
Exposed Area
Salinity
Elevation
Salinity (mg/l) or Exposed Area (acres
Elevation (ft)
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
-228
-238
-248
-258
-268
-278
Jan-03
Jan-06
Jan-09
Jan-12
Jan-15
Jan-18
Jan-21
Jan-24
Jan-27
Jan-30
Jan-33
Jan-36
Jan-39
Jan-42
Jan-45
Jan-48
Jan-51
Jan-54
Jan-57
Jan-60
Jan-63
Jan-66
Jan-69
Jan-72
Jan-75


North Sea Combined Alternative SEA Chart
8000 acres of SHC
6000 acres of SHC
4000 acres of SHC
2000 acres of SHC
No. Lake Combined w/o SHC
No Action w/ AQM
No Action w/o AQM
Exposed Area
Salinity
No Action Salinity
Elevation
No Action Elevation
Salinity (mg/l) or Exposed Area (acres
Elevation (ft)
200000
175000
150000
125000
100000
75000
50000
25000
0
-228
-238
-248
-258
-268
-278
Jan-03
Jan-06
Jan-09
Jan-12
Jan-15
Jan-18
Jan-21
Jan-24
Jan-27
Jan-30
Jan-33
Jan-36
Jan-39
Jan-42
Jan-45
Jan-48
Jan-51
Jan-54
Jan-57
Jan-60
Jan-63
Jan-66
Jan-69
Jan-72
Jan-75


North Sea Combined Alternative SEA (640 kaf/yr inflows)
10000 acres of SHC
8000 acres of SHC
6000 acres of SHC
4000 acres of SHC
2000 acres of SHC
No Action w/ AQM
No Action w/o AQM
Exposed Area
Salinity
No Action Salinity
Elevation
No Action Elevation
Salinity (mg/l) or Exposed Area (acres
Elevation (ft)
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
-228
-238
-248
-258
-268
-278
Jan-03
Jan-06
Jan-09
Jan-12
Jan-15
Jan-18
Jan-21
Jan-24
Jan-27
Jan-30
Jan-33
Jan-36
Jan-39
Jan-42
Jan-45
Jan-48
Jan-51
Jan-54
Jan-57
Jan-60
Jan-63
Jan-66
Jan-69
Jan-72
Jan-75